

CLAIMS

1. A recording medium in which an application, a digital stream, and management information are recorded, wherein

5 the application is a program that is written in a programming language for a virtual machine,

 a life cycle during which the application can be executed by the virtual machine is specified, and

10 the management information indicates a playback control of the digital stream that is performed during the life cycle simultaneously with the execution of the application.

2. The recording medium of Claim 1 in which a plurality of pieces of play list information, which define playback paths of the digital

15 stream, are further recorded, wherein

 the playback control indicated by the management information is to play back the digital stream in accordance with a playback path that is indicated by a piece of play list information to which a predetermined playback attribute has been attached.

20

3. The recording medium of Claim 2, wherein

 the predetermined playback attribute is an attribute indicating that a playback is automatically started in accordance with the playback path that is indicated by the piece of play list information, and

 the playback of the digital stream is performed simultaneously with the execution of the application when the playback attribute indicating that the playback is automatically started is attached to the piece of play list information.

4. The recording medium of Claim 2 in which a title unboundary application that has no life cycle is further recorded, wherein the title unboundary application performs a process of

5 selecting one piece of play list information from the plurality of pieces of play list information recorded in the recording medium in accordance with a value stored in a status register of a playback apparatus, and

the predetermined playback attribute is an attribute

10 indicating that a playback is started after the selection of one piece of play list information by the title unboundary application.

5. The recording medium of Claim 1, wherein

the management information further includes a continuous

15 playback flag that defines a recovery process that is to be performed when the application terminates abnormally, and

the continuous playback flag, when set to a predetermined value, indicates that the playback of the digital stream performed simultaneously with the execution of the application is continued

20 after the application terminates abnormally.

6. The recording medium of Claim 1, wherein

the management information further includes a flag that defines a recovery process that is performed when the application

25 terminates abnormally, and

the flag is classified into:

a flag (i) that indicates whether or not the application is restarted after the application terminates abnormally;

a flag (ii) that indicates an event that is output when

the application terminates abnormally; and

a flag (iii) that indicates whether or not a playback apparatus is rebooted.

5 7. The recording medium of Claim 1 in which a plurality of applications are recorded, wherein

each of the plurality of applications belongs to any of a plurality of titles, and

10 a life cycle of each application is represented using a title.

8. A playback apparatus, comprising:

a virtual machine unit operable to execute an application that is recorded in a recording medium;

15 a playback control engine unit operable to playback a digital stream that is recorded in the recording medium; and

an application manager operable to cause the virtual machine unit to execute the application when a life cycle of the application is reached, and at a same time, to cause the playback control 20 engine unit to play back the digital stream in accordance with management information that is recorded in the recording medium.

9. The playback apparatus of Claim 8, wherein

25 a playback control performed by the application manager includes a control that causes the playback control engine unit to output a composite image that is composed of: an execution image of the application as a parent screen; and a playback image of the digital stream as a child screen.

10. The playback apparatus of Claim 9, wherein
the application manager performs a control that causes the
playback control engine unit to play back the playback image of
the digital stream as a main image during a start-up delay until
5 the application gets into an operation status, and
causes the playback control engine unit to display the
composite image after the application normally gets into the
operation status.
- 10 11. The playback apparatus of Claim 10, wherein
the application manager further performs a control that
causes the playback control engine unit to play back the playback
image of the digital stream as the main image when a start-up
failure or an abnormal termination of the application occurs.
15
12. The playback apparatus of Claim 8, wherein
a plurality of pieces of play list information, which define
playback paths of the digital stream, are recorded in the recording
medium, and
20 the playback control performed by the application manager
is to play back the digital stream in accordance with a playback
path that is indicated by a piece of play list information to
which a predetermined playback attribute has been attached.
- 25 13. The playback apparatus of Claim 12, wherein
the predetermined playback attribute is an attribute
indicating that a playback is automatically started in accordance
with the playback path that is indicated by the piece of play
list information.

14. The playback apparatus of Claim 12, wherein
a title unboundary application that has no life cycle is
further recorded in the recording medium, wherein
5 the title unboundary application performs a process of
selecting one piece of play list information from the plurality
of pieces of play list information recorded in the recording medium
in accordance with a value stored in a status register of the
playback apparatus,
- 10 the predetermined playback attribute is an attribute
indicating that a playback is started after the selection of one
piece of play list information by the title unboundary application,
and
15 the playback of the digital stream by the playback control
engine unit is performed in accordance with a piece of play list
information to which the predetermined playback attribute is
attached and that is selected by the title unboundary application.
15. The playback apparatus of Claim 8, wherein
20 the management information further includes a continuous
playback flag that defines a recovery process that is to be
performed when the application terminates abnormally, and
25 the application manager further judges whether or not the
continuous playback flag has been set to a predetermined value,
and if the continuous playback flag has been set to the
predetermined value, causes the playback control engine unit to
continue the playback of the digital stream simultaneously with
the execution of the application after the application terminates
abnormally.

16. The playback apparatus of Claim 8, wherein
the life cycle of the application is indicated by management
information that is recorded in the recording medium,
5 the management information further includes a flag that
defines a recovery process that is performed when the application
terminates abnormally, and
the application manager performs, in accordance with the
flag in the management information, one of:
10 a control (1) that restarts the application after the
application terminates abnormally;
a control (2) that outputs a predetermined event; and
a control (3) that reboots the playback apparatus.
- 15 17. The playback apparatus of Claim 8 comprising
a permission controller operable to perform authentication
of the application if the application instructs a playback
specifying a piece of play list information, wherein
the playback control engine unit performs the instructed
20 playback in accordance with the specified piece of play list
information if the permission controller certifies authenticity
of the application through the authentication.
18. The playback apparatus of Claim 8, wherein
25 if the application is to perform a playback in accordance
with play list information, the application manager determines
a piece of play list information that can be played back by the
application, and notifies the application of the determined piece
of play list information, and

the playback control engine unit performs the playback in accordance with the notified piece of play list information.

19. A program that is read into a computer that includes a virtual
5 machine unit operable to execute an application that is recorded in a recording medium, and a playback control engine unit operable to play back a digital stream that is recorded in the recording medium, the program causing the computer to execute the steps of:

10 causing the virtual machine unit to execute the application when a life cycle of the application is reached, and at the same time

causing the playback control engine unit to play back the digital stream in accordance with management information that is recorded
15 in the recording medium.

20. A playback method for a computer that includes a virtual machine unit operable to execute an application that is recorded in a recording medium, and a playback control engine unit operable to play back a digital stream that is recorded in the recording
20 medium, the playback method causing the computer to execute the steps of:

causing the virtual machine unit to execute the application when a life cycle of the application is reached, and at the same
25 time

causing the playback control engine unit to play back the digital stream in accordance with management information that is recorded in the recording medium.

21. A system integrated circuit that is embedded into a playback apparatus that plays back a digital stream, the system integrated circuit comprising:

a virtual machine unit operable to execute an application
5 that is recorded in a recording medium; and
an application manager operable to cause the virtual machine unit to execute the application when a life cycle of the application is reached, and at a same time, to cause the playback control engine unit to play back the digital stream in accordance with
10 management information that is recorded in the recording medium.